

DEPOSITORIES OF CANADIAN REPORTS IN U. S. LIBRARIES	
Canadian reports (AECL series) are available at the AEC depository libraries listed above.	
DEPOSITORIES OF USAEC REPORTS IN LIBRARIES OUTSIDE THE U. S.	
ARGENTINA	
Buenos Aires, Comision Nacional de Energia Atomica	
AUSTRALIA	
Canberra, Australian National Library	
Coogee, New South Wales, Australian Atomic Energy Commission	
AUSTRIA	
Vienna, Institut für Radiumforschung der Oesterreichischen Akademie der Wissenschaften	
BURMA	
Rangoon, Union of Burma Applied Research Institute	
CANADA	
Ottawa, National Research Council Library	
DENMARK	
Copenhagen, Atomic Energy Commission, c/o Institute of Theoretical Physics	
EGYPT	
Cairo, Atomic Energy Commission	
ENGLAND	
Birmingham, Birmingham Central Library	
Liverpool, Lancashire County Council Library	
London, Science Museum Library	
Manchester, Manchester Central Library	
Nottingham, Nottingham Central Library	
Sheffield, Sheffield Central Library	
FINLAND	
Helsinki, Teknillisen Korkeakoulun Kirjasto	
FORMOSA (TAIWAN)	
Taipei, National Tsing Hua University Library	
FRANCE	
Gif-sur-Yvette, Centre d'Etudes Nucleaires de Saclay	
GREECE	
Athens, Greek Atomic Energy Commission	
HAITI	
Port au Prince, National Library	
INDIA	
Bombay, Department of Atomic Energy	
ISRAEL	
Tel Aviv, Israel Atomic Energy Commission	
ITALY	
Rome, Istituto Nazionale delle Ricerche	
JAPAN	
Tokyo, Science Section, Diet Library	
LEBANON	
Beirut, American University	
NETHERLANDS	
Utrecht, Stichting Reactor Centrum	
PAKISTAN	
Karachi, Atomic Energy Commission	
PERU	
Lima, Biblioteca Nacional	
PHILIPPINE REPUBLIC	
Manila, American Embassy	
PORTUGAL	
Lisbon, Junta de Energia Nuclear	
SCOTLAND	
Glasgow, Corporation of Glasgow Library's Department "Mitchell"	
SPAIN	
Madrid, Junta de Energia Nuclear	
SWEDEN	
Stockholm, Atomenergi AB	
SWITZERLAND	
Geneva, United Nations Library	
UNION OF SOUTH AFRICA	
Pretoria, Library and Information Division, South African Council for Scientific and Industrial Research	

DEPOSITORIES OF BRITISH REPORTS IN U. S. LIBRARIES

British reports (AERE series) currently issued are available at all the AEC depository libraries listed above. More complete sets of older reports are available at the following libraries:

CALIFORNIA	
Berkeley, University of California General Library	
ILLINOIS	
Chicago, John Crerar Library	
NEW YORK	
New York, New York Public Library	
NORTH CAROLINA	
Durham, Duke University Library	

*Also serves as an Industrial Information Depository Library.

TABLE OF CONTENTS

Vol. 10, No. 9, May 15, 1956

Category	Abstract	Page	Category	Abstract	Page																																																																																																																																	
BIOLOGY AND MEDICINE																																																																																																																																						
Radiation Effects	3165		MINERALOGY, METALLURGY, AND CERAMICS																																																																																																																																			
Radiotherapy	3167		Toxicology Studies	3168		Metals and Metallurgy	3193		Tracer Applications	3169		PHYSICS			CHEMISTRY						Analytical Procedures	3173	400	Instruments	3201	403	Laboratories and Equipment			Isotopes	3201		Radiation Effects	3179		Mass Spectrography	3210		Separation Procedures	3180		Mathematics	3211		Sorption Phenomena	3183		Measuring Instruments and Techniques	3212		Tracer Applications	3184		Mesons	3215		Uranium and Uranium Compounds	3185		Microwaves	3217		ENGINEERING						Heat Transfer and Fluid Flow	3187	402	Neutrons	3218		Materials Testing	3188		Nuclear Physics	3222		MINERALOGY, METALLURGY, AND CERAMICS						Corrosion	3190		Nuclear Properties	3225		Geology and Mineralogy	3192		Nuclear Reactors	3226					Nuclear Transformation	3238					Particle Accelerators	3239					Radiation Absorption and Scattering	3241					Radioactivity	3243					Spectroscopy	3245					Uranium and Uranium Compounds	3246	
Toxicology Studies	3168		Metals and Metallurgy	3193																																																																																																																																		
Tracer Applications	3169		PHYSICS																																																																																																																																			
CHEMISTRY																																																																																																																																						
Analytical Procedures	3173	400	Instruments	3201	403																																																																																																																																	
Laboratories and Equipment			Isotopes	3201																																																																																																																																		
Radiation Effects	3179		Mass Spectrography	3210																																																																																																																																		
Separation Procedures	3180		Mathematics	3211																																																																																																																																		
Sorption Phenomena	3183		Measuring Instruments and Techniques	3212																																																																																																																																		
Tracer Applications	3184		Mesons	3215																																																																																																																																		
Uranium and Uranium Compounds	3185		Microwaves	3217																																																																																																																																		
ENGINEERING																																																																																																																																						
Heat Transfer and Fluid Flow	3187	402	Neutrons	3218																																																																																																																																		
Materials Testing	3188		Nuclear Physics	3222																																																																																																																																		
MINERALOGY, METALLURGY, AND CERAMICS																																																																																																																																						
Corrosion	3190		Nuclear Properties	3225																																																																																																																																		
Geology and Mineralogy	3192		Nuclear Reactors	3226																																																																																																																																		
			Nuclear Transformation	3238																																																																																																																																		
			Particle Accelerators	3239																																																																																																																																		
			Radiation Absorption and Scattering	3241																																																																																																																																		
			Radioactivity	3243																																																																																																																																		
			Spectroscopy	3245																																																																																																																																		
			Uranium and Uranium Compounds	3246																																																																																																																																		

BIOLOGY AND MEDICINE

3163 MLM-1050

Mound Lab., Miamisburg, Ohio.

THE EFFECT OF SONIC OSCILLATIONS AND HIGH PRESSURES ON YEAST CELLS. Harold E. Smith. May 16, 1955. 6p. Contract AT-33-1-GEN-53. \$0.15(OTS).

Subjecting *Saccharomyces cerevisiae* to sonic oscillations or to high pressures will cause cell rupture and loss of viability. (auth)**3164 UCRL-3247**

California. Univ., Berkeley. Radiation Lab.

THE TRANSPORT OF CALCIUM AND OTHER CATIONS IN SUBMERGED AQUATIC PLANTS. Benjamin Lowenaupt. Nov. 8, 1955. 40p. Contract [W-7405-eng-48]. \$6.30(ph OTS); \$3.00(mf OTS).

Photosynthetic bicarbonate assimilation and cation transport by aquatic plants are briefly reviewed. Several investigations of cation transport not directly associated with photosynthesis are also reviewed. A general theory of cation transport is presented. (auth)

RADIATION EFFECTS

3165 UCRL-3268

California. Univ., Berkeley. Radiation Lab.

MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] OCTOBER, NOVEMBER, DECEMBER 1955. Jan. 24, 1956. 61p. Contract W-7405-eng-48. \$0.40(OTS).

Progress is reported in the following studies: the effect of therapeutic doses of At^{211} on reproduction and development in rats; the tissue distribution and excretion of Ac^{227} in rats; the effect of stable Tb on the distribution of intravenously administered Tb^{160} in rats; the radiation chemistry of formic acid and glycine; the formation of x-ray-induced dominant lethal mutations in *Saccharomyces*; factors affecting storage of red blood cells in the spleen; tracer studies of Fe metabolism in man; blood volume determinations; electrocardiographic changes in dogs as a manifestation of myocardial alteration following burns; P³² tracer studies on the effects of radiation on nucleic acid metabolism in rats and in Ehrlich ascites tumor cells inoculated into mice; a mathematical analysis of the concentration dependence of frictional and sedimentation coefficients of proteins; and radioinduced changes in lipoprotein metabolism in rats. (For preceding period see UCRL-3208.) (C.H.)**3166 UCSF-12**

California. Univ., San Francisco. School of Medicine Radiological Lab.

SEMIANNUAL REPORT FOR PERIOD ENDING DECEMBER 31, 1955. Jan. 1956. 59p. Contract AT-11-1-GEN-10, Project No. 2. \$10.80(ph OTS); \$3.90(mf OTS).

Physics. Equipment is described which was developed for use in analysis of beam shapes and absorption phenomena in the 70-Mev synchrotron beam. Biology. A general

plan of exposure and dosimetry is presented for use in a series of determinations of relative biological effects of 1000-kvp and 250-kvcp x rays. Data are presented on the relative biological efficiency of 1000-kvp x rays compared with 250-kvcp x rays as determined from dose-survival curves of haploid and diploid *Saccharomyces* irradiated in the resting stage, from the results of mortality studies with adult CAF₁ mice, and from dose-response curves for testicular weight in the mouse. Data are included from a preliminary study of the effects of cortisone on the radiation reaction of the lung in rats. The application of statistical analysis to experiments on biological effects of radiation carried out with two different irradiating machines is discussed. (For preceding period see UCSF-11.) (C.H.)

RADIOTHERAPY

3167 ACRH-4

Argonne Cancer Research Hospital, Chicago.

SEMIANNUAL REPORT TO THE ATOMIC ENERGY COMMISSION. Leon O. Jacobson, ed. Sept. 1955. 110p. Contract AT-(11-1)-69. \$16.80(ph OTS); \$5.70(mf OTS).

Data are presented from studies on the effect of non-cellular and heterologous tissue preparations on survival of mice after lethal doses of x radiation; the effect of total-body x irradiation on diuresis in rats; the preparation of tritium-labeled cholesterol and isopropyl benzoate by means of the $\text{Li}^6(n,\alpha)\text{T}$ reaction; the preparation of water-soluble uranium dithiocarbamates; and development of a semi-micro method for the isolation and purification of radioactive cholesterol. A list of staff publications during the period is included, and the tests or summaries of articles submitted for publication are included. (For preceding period see ACRH-3.) (C.H.)

TOXICOLOGY STUDIES

3168 UR-430

Rochester, N. Y. Univ. Atomic Energy Project.

THE METABOLISM OF POLONIUM²¹⁰ ADMINISTERED BY INTRATRACHEAL INJECTION TO THE RAT. Robert G. Thomas and J. N. Stannard. Feb. 21, 1956. 38p. Contract W-7401-eng-49. \$6.30(ph OTS); \$3.00(mf OTS).

The distribution and excretion of Po²¹⁰ has been studied in rats receiving a soluble salt of this element by intratracheal injection (intubation). The metabolism was found to differ markedly in some respects from that seen after either oral or intravenous administration. (auth)

TRACER APPLICATIONS

3169 TID-8008

Technical Information Service, AEC.

ISOTOPES IN AGRICULTURE. Joseph S. Butts, Oregon State Coll. Mar. 1956. 5p. \$0.15(OTS).

One of its monograph series "The Industrial Atom".

CHEMISTRY

3170 AEC-tr-2389

STRATIFICATION IN THE MOLTEN RECIPROCAL SYSTEMS OF GROUPS I AND II ELEMENTS. M. L. Sholokhovich, D. S. Lesnykh, G. A. Bukhalova, and A. G. Bergman. Translated from Doklady Akad. Nauk S.S.R. 103, 261-3 (1955). 7p.

It has been established that the increase of the thermal effect of an exchange reaction may result in stratification. This stratification is illustrated in a series of halide-sulfate systems of Th and Ag, which are discussed in some detail. (B.J.H.)

3171 AEC-tr-2396

BIOCHEMISTRY OF SCANDIUM AND ITS PRECIPITATION AS THE PHYTATE. G. Beck. Translated by K. S. Bevis from Mikrochemie ver Mikrochim. Acta 34, 62-6(1948). 4p.

Scandium gives a very difficultly soluble neutral salt with inositol hexaphosphoric acid (phytic acid), which serves for the detection and isolation of the element. It is also difficultly soluble in mineral acids. The difficultly soluble phytates of Ti, Zr, Hf, and Th can be separated by complex chemical methods. Scandium was isolated from urine, milk, blood, liver and brains, and determined as the phytate. (auth)

3172 AEC-tr-2406

THERMOGRAPHIC METHOD OF DETERMINING THE CONSTANTS OF THE CHEMICAL EQUILIBRIUM OF THE RECIPROCAL FUSED SYSTEMS. K. Tovmasjan. Translated from Doklady Akad. Nauk S.S.R. 77, 429-32(1951). 8p.

A thermographic method for the determination of equilibrium constants in fused salt systems is presented. The equilibrium type, $AX + BY = AY + BX + Q$, is discussed. (C.W.R.)

ANALYTICAL PROCEDURES

3173 CF-56-3-60

Oak Ridge National Lab., Tenn.

SPECTROGRAPHIC ANALYSIS OF TISSUES FOR TRACE ELEMENTS. Progress Report [for] July 1, 1955 through December 31, 1955. I. H. Tipton, M. J. Cook, R. S. Steiner, W. D. Foland, D. K. Bowman, and K. K. McDaniel. Mar. 12, 1956. 47p. Contract [W-7405-eng-26]. \$7.80 (ph OTS); \$3.30(mf OTS).

Normal human tissues were analyzed spectrographically for the presence of certain low-concentration elements. Tabulated data are arranged by elements and by tissues. (C.H.)

3174 KAPL-200

Knolls Atomic Power Lab., Schenectady, N. Y.

AN ELECTROLYTIC METHOD FOR SEPARATING AND DETERMINING RUTHENIUM IN SOME REDOX SOLUTIONS. Anita Camilli and John F. Flagg. June 17, 1949. Decl. Nov. 22, 1955. 15p. Contract W-31-109-Eng-52.

An electrolytic method for the determination of Ru in Redox Process solutions is presented. Cell conditions are: electrolyte—0.1N $HNO_3 + NaNO_2$; gold-plated Cu cathode; potential—6v; current—0.5 amp; and electrolysis time $2\frac{1}{2}$ hr. (C.W.H.)

3175 NLCO-595

National Lead Co. of Ohio, Cincinnati.

PROCEEDINGS OF BIO-ASSAY AND ANALYTICAL

CHEMISTRY MEETING, OCTOBER 6 AND 7, 1955.

Reynold L. Hoover, ed. Oct. 7, 1955. 156p. Contract AT(30-1)-1156. \$0.75(OTS).

Fluorophotometric determination of U in urine and air, electrodeposition of enriched U in urine, determination of fluoride in water, determinations of tritium and Hg in urine and water, natural radioactivity of man, determination of μ g quantities of Ra, and counting techniques and instrumentation are some of the subjects discussed at the bio-assay and analytical chemistry meeting. (J.E.D.)

3176 ORNL-2006

Oak Ridge National Lab., Tenn.

IMPROVED TECHNIQUES FOR THE ISOTOPIC ANALYSIS OF BORON ON THE MASS SPECTROMETER. C. E. Melton, L. O. Gilpatrick, Russell Baldock, and R. M. Healy. Feb. 10, 1956. 8p. Contract W-7405-eng-26. \$1.80(ph OTS); \$1.80(mf OTS).

Ordinary mass spectrometer methods for the isotopic analysis of boron, using boron trifluoride gas, are not adequate for the routine analysis of enriched boron isotopes because of interference with the analysis by residual gases or compounds from previous samples measured in the spectrometer. A new method for reducing "memory" has been developed in which boron trichloride gas is used to remove the adsorbed boron trifluoride from the mass spectrometer. Boron trifluoride samples of known isotopic composition were assayed by this method, and the results were compared with those obtained by no special techniques. (auth)

3177 ORNL-2040

Oak Ridge National Lab., Tenn.

AUTOMATIC PHOTOMETRIC TITRATION OF SULFATE. F. J. Miller and P. F. Thomason. Mar. 15, 1956. 17p. Contract W-7405-eng-26. \$0.20(OTS).

The rapid microtitration of sulfate with standard $Ba(ClO_4)_2$ solutions by use of 1-(o-arsenophenylazo)-2-naphthol-3,6-disulfonic acid (Thoron) as an adsorption indicator was adapted for automatic photometric titration. A simple titration-cell assembly was devised that incorporates an interference filter and a phototube. Voltage from the phototube is used to actuate the titrator and is recorded. The end point is determined from the recorded plot of voltage versus volume of titrant added to the test solution. Quantities of sulfate in the range 0.048 to 17 mg were titrated. (auth)

3178 AEC-tr-2407

PURIFICATION OF SOLVENTS FOR SPECTROGRAPHIC PURPOSES. PART II. M. Pestemer. Translated by D. E. Cardamone from Angew. Chem. 67, 740-1(1955). 4p.

Adsorption procedures are outlined for the purification of organic solvents for use in spectrographic analysis. The permeabilities of the solvents in the KBr region (15 to 25μ) are tabulated. (C.W.H.)

LABORATORIES AND EQUIPMENT

Refer to abstract 3244.

RADIATION EFFECTS

3179 TID-8005

Technical Information Service, AEC.

THE INITIATION OF CHEMICAL REACTIONS BY GAMMA AND OTHER IONIZING RADIATIONS. David S. Ballantine,

Brookhaven National Lab. Feb. 1956. 6p. \$0.15(OTS). One of its monograph series "The Industrial Atom." The interactions of γ radiation with matter to produce ion pairs, radicals, or excited molecules are discussed. The radiation-induced reactions, chain-type (polymerization) and mass-action (irradiation of benzene) are reviewed. (J.E.D.)

SEPARATION PROCEDURES

3180 DOW-141

Dow Chemical Co. Western Div., Pittsburg, Calif. PROGRESS REPORT [FOR] JANUARY-FEBRUARY 1956. Research Dept. R. H. Bailes. Mar. 1, 1956. 26p. Contract AT-30-1-GEN-236. \$4.80(ph OTS); \$2.70(mf OTS).

Studies of the recovery of uranium from plateau ores by solvent extraction of aqueous leach liquors and slurries with organic phosphate solutions and by non-aqueous leaching with organic leach solutions are presented. (auth)

3181 K-706

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

SOME FACTORS INFLUENCING THE USE OF TRIBUTYL PHOSPHATE FOR THE EXTRACTION OF URANIUM IN ANALYSIS. T. W. Bartlett. Feb. 27, 1951. Decl. Oct. 17, 1955. 28p. Contract W-7405-eng-26.

A study was made of the analytical application of tributyl phosphate extraction of uranium from aqueous solution. The extraction of uranium from nitric acid solutions by tributyl phosphate was favored by the addition of sodium or ammonium nitrate, by high tributyl phosphate concentration in tributyl phosphate-hexane mixtures, and, in the absence of other nitrates, by increasing the nitric acid concentration. With undiluted tributyl phosphate a distribution coefficient of 110 was obtained from 5 molar nitric acid and 290 from a 2 molar nitric acid solution containing 30 g/100 ml sodium nitrate. Iron(III), copper(II), nickel(II), and chromium(III) were extracted in trace amounts. Sulfate, phosphate, fluoride, chloride, and silicate interfere by one or more of the following methods: by decreasing the extraction of uranium; by extracting with the uranium or by increasing the extraction of other impurities; and by the formation of emulsions. Uranium was extracted from the tributyl phosphate with sodium carbonate solution or with sodium or ammonium sulfate solution. (auth)

3182 Y-431

Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.

SEPARATION OF HAFNIUM FROM ZIRCONIUM BY EXTRACTION OF THIOCYANATE COMPLEXES. L. G. Overholser, C. J. Barton, and W. R. Grimes. June 28, 1949. Decl. Nov. 17, 1955. 24p.

The separation of Hf from Zr which utilizes differences in extractability by ether of the thiocyanate complexes was investigated. Advantages of this extraction method include high separation factors, short equilibration time, and availability of chemicals involved. (C.W.H.)

SORPTION PHENOMENA

3183 HW-34499

Hanford Atomic Products Operation, Richland, Wash. ADSORPTION AND RETENTION OF STRONTIUM BY SOILS

OF THE HANFORD PROJECT. J. R. McHenry. Feb. 1, 1955. 36p. Contract W-31-109-eng-52. \$6.30(ph OTS); \$3.00(mf OTS).

The adsorption of strontium ion from solution by a composite Hanford soil was found to be a function of the strontium ion concentration, pH, time of contact, and the nature and concentration of the complementary ions. Increasing concentration of a complementary ion generally decreases strontium adsorption. The influence of monovalent ions on strontium adsorption is in the order: $Cs^+ > NH_4^+ = K^+ > Na^+ > Li^+$, where cesium ion is the most effective in reducing strontium uptake. Increased adsorption is noted in the presence of $C_2O_4^{2-}$ and PO_4^{3-} . The presence of sodium nitrate reduces strontium ion adsorption. Hydrogen ion is the most effective in replacing strontium. Other cations which replace strontium are in order: $La^{+3} > Ba^{+2} < Ca^{+2} > Mg^{+2} > K^+ > Na^+ > Li^+$. (auth)

TRACER APPLICATIONS

3184 UCLA-360

California Univ., Los Angeles. Atomic Energy Project. THE METABOLISM OF THE ESSENTIAL FATTY ACIDS. V. THE METABOLIC PATHWAY OF LINOLEIC ACID. Gunther Steinberg, William H. Slaton, Jr., David R. Howton, and James F. Mead. Feb. 15, 1956. 21p. Contract AT-04-1-GEN-12. \$3.30(ph OTS); \$2.40(mf OTS).

URANIUM AND URANIUM COMPOUNDS

3185 NBS-C-568

National Bureau of Standards, Washington, D. C.

HIGH-TEMPERATURE REACTIONS OF URANIUM DIOXIDE WITH VARIOUS METAL OXIDES. S. M. Lang, F. P. Knudsen, C. L. Fillmore, and R. S. Roth. Feb. 20, 1956. 34p. \$0.20(GPO).

The high-temperature reactions of UO_2 with 15 metal oxides are described. The systems are discussed in groups according to the cation valence of the second oxide; the divalent oxides BeO , MgO , CaO , SrO , BaO , and CuO ; the trivalent oxides Al_2O_3 , Y_2O_3 , and Nd_2O_3 ; the tetravalent oxides SiO_2 , ZrO_2 , SnO_2 , CeO_2 , and ThO_2 ; and the pentavalent oxide V_2O_5 . A brief review is presented for the relations in the U-O system, particularly in the region of UO_2 . Detailed descriptions of the equipment and the procedures used are included. (auth)

3186 ORNL-2025, ORNL-2026

and ORNL-2034

Oak Ridge National Lab., Tenn.

RAW MATERIALS PROCESS TESTING. Pilot Plant Section Progress Reports [for] February, March, April 1955. K. O. Johnsson, ed. (Feb. (ORNL-2025), 33p.; Mar. (ORNL-2026), 23p.; Apr. (ORNL-2034), 23p.). Contract W-7405-eng-26. \$0.25 each (OTS).

The effects of process variables on U extraction efficiency, over-all recovery, and product purity of the amine extraction process were investigated. Studies were continued on mixing and phase separation in the single-stage mixer-settler under continuous flow conditions, and on the effects of mixing variables on the amount of organic entrainment in clarified raffinate from slurring extractions. (C.W.H.)

ENGINEERING

HEAT TRANSFER AND FLUID FLOW

3187 NYO-7638

Columbia Univ., New York.

POOL BOILING HEAT TRANSFER WITH MERCURY.

C. F. Bonilla, J. S. Busch, A. Stalder, N. S. Shaikhmamud, and A. Ramachandran. [Mar. 6, 1956]. 24p. Contract AT(30-1)-1042. (CU-11-56-AT-1042-Ch.E.) \$4.80(ph OTS); \$2.70(mf OTS).

Hg was boiled on a horizontal low-C steel plate at pressures from 4 mm. of Hg to 45 lbs./sq. in. absolute, depths of 2 to 10 cm., heat velocities of 4,000 to 200,000 BTU/hr./sq. ft., and with and without wetting agent additions. The nature of the boiling and the necessary temperature differential were observed. (auth)

MATERIALS TESTING

3188 TID-5140

Franklin Inst. Labs. for Research and Development, Philadelphia.

INVESTIGATION OF MATERIALS FOR WATER LUBRICATED THRUST BEARINGS. Period Covered—March 5, 1951 to June 30, 1953. S. Abramovitz. Classification changed from OFFICIAL USE ONLY Sept. 21, 1955. 31p. For Westinghouse Electric Corp. Contract [AT-11-1-GEN-14], Subcontract 14-313. (F-2243).

Thrust bearings and thrust bearing test machines were designed and built to test bearing materials with water as a lubricant. Of the materials tested it was found that Cold Pressed Alundum running against itself appeared to have the best minimum wear and anti-seizure characteristics. In general, the test program not only gave information about compatibility of materials but also demonstrated the particular requirements of bearing surface preparation. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

3189 NYO-7175

Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy.

THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. Progress Report. Jan. 31, 1956. 46p. Contract AT(30-1)-956. (MITS-30). \$7.80(ph OTS); \$3.30(mf OTS).

Adsorption studies of flotation agents on AgI, electrochemical studies of adsorption of Ag₂S, solubility of quartz, and steaming potential studies on corundum are reported. A study was made of flotation kinetics, adsorption of 1-hexanethiol on gold, effects of chemical agents on grinding, comminution studies in a vibratory ball mill, and brittle fracture patterns. (J.E.D.)

CORROSION

3190 HW-37636

Hanford Atomic Products Operation, Richland, Wash. HIGH TEMPERATURE AQUEOUS CORROSION OF COM-

MERCIAL ALUMINUM ALLOYS. R. L. Dillon, R. E. Wilson, and V. H. Troutner. Jan. 11, 1956. 14p. Contract W-31-109-Eng-52. \$0.15(OTS).

The corrosion resistance of some 50 commercial Al alloys has been investigated in high temperature distilled H₂O. From static autoclaves conducted at 250, 305, and 350°C, the Al-Ni, Al-Si, Al-Cu-Ni, and Al-Mg-Si alloys have been shown to be most corrosion resistant. In cases of rapid failure the attack is intergranular. The more resistant alloys all contain significant amounts of Cu, Ni, or Si. (auth)

3191 AEC-tr-2404

INTERCRYSTALLINE CORROSION OF HIGH PURITY ALUMINUM AND ITS EFFECTS ON THE NATURE OF GRAIN BOUNDARIES. Paul Lacombe and Nicolas Yannquis. Translated by K. S. Bevis from Métaux & corrosion 22, 35-7 (1947). 4p.

Experiments with pure aluminum showed that the special resistance of the edges separating some orientation crystals, adjacent to each other or in a twin position, cause the intercrystalline corrosion because of discontinuities in the adjacent lattices. (R.V.J.)

GEOLOGY AND MINERALOGY

3192 TEI-525

Geological Survey.

URANIUM MINERALS IN OLIGOCENE GYPSUM NEAR CHADRON, DAWES COUNTY, NEBRASKA. R. J. Dunham. May 1955. 31p.

Carnotite, sabugalite [HAl(UO₂)₄(PO₄)₄·16H₂O], and autunite occur in the basal 25 ft of a 270-ft sequence of non-marine bedded gypsum and gypsiferous clay in the Brule formation of Oligocene age in northeastern Dawes County, Neb. Uranium minerals are visible at only two localities and are associated with carbonaceous matter. Elsewhere in the basal 25 ft of the gypsum sequence is interbedded with carbonate rocks and is weakly but persistently uraniferous. Uranium probably was emplaced from above by uranyl solutions rich in sulfate. (auth)

METALS AND METALLURGY

3193 ANL-5360

Argonne National Lab., Lemont, Ill.

SOME THEORETICAL FACTORS IN THE ZONE MELTING PROCESS. Richard J. Dunworth. Feb. 1956. 38p. Contract W-31-109-eng-38. \$0.30(OTS).

Equations are presented for calculating solute distribution after zone melting. A method is given for estimating the number of passes required to obtain the ultimate distribution. The influence of various solidification factors on the purification resulting from zone melting is described. The effect of hexagonal projections, if present, is considered to be slight and dendrites are presumed to be absent. The existence of a high solute concentration at the solidifying interface is demonstrated. The importance of this solute gradient on the purification is emphasized. The necessity of using slow rates of solidification or agitation to reduce the effectiveness of this gradient is shown. (auth.)

3194 BMI-725

Battelle Memorial Inst., Columbus, Ohio.

SPOT WELDING OF AMES THORIUM. R. E. Monroe, D. C. Martin, and C. B. Voldrich. Jan. 31, 1952. Decl. Nov. 9, 1955. 17p. Contract W-7405-eng-92.

Spot welds were made in $\frac{1}{16}$ -in.-thick Ames thorium sheet over a range of welding conditions. Various conditions produced satisfactory welds, but a 2-impulse cycle with postheat or current decay and variable pressure gave the best results. Ultimate loads of 1750 to 1850 lb in tension shear were consistently attained with these conditions. No difficulty was encountered with cracking of the welds in $\frac{1}{16}$ -in. sheet. There was some indication that cracking might present a problem in welding thicker thorium sheet. (auth)

3195 BMI-829

Battelle Memorial Inst., Columbus, Ohio.

KINETICS OF THE ZIRCONIUM-NITROGEN AND ZIRCONIUM-TIN-NITROGEN SYSTEMS. M. W. Mallett, J. Belle, and B. B. Cleland. May 26, 1953. Decl. Nov. 22, 1955. 30p. Contract W-7405-eng-92.

A study was made of the kinetics of the zirconium-nitrogen and zirconium-tin-nitrogen systems in the temperature range of 920 to 1640°C at 1 atmosphere pressure. The tin contents ranged from 0 to 5 wt %. The reaction of nitrogen with zirconium or zirconium-tin alloys follows a parabolic law after an initial induction period. The presence of small amounts of tin as an alloy constituent appears to retard the over-all rate of the reaction to a small extent. The presence of tin in solid solution in beta zirconium has little effect upon the rate of diffusion of nitrogen within the metal. The limiting solubilities of nitrogen in beta zirconium and zirconium-tin alloys were determined from the diffusion data. (auth)

3196 ISC-644

Ames Lab., Ames, Iowa.

QUARTERLY SUMMARY RESEARCH REPORT IN METALLURGY FOR APRIL, MAY, JUNE 1955. Feb. 9, 1956. 30p. Contract W-7405-eng-82. \$0.25(OTS).

The extraction of Th from monazite-sulfate solution, separation of Ta from Nb and Zr from Hf, preparation of ThCl_4 , YF_3 , and VaF_3 , preparation of Va, Nb, and Y metals, and phase studies of U-Zn, Th-Zr, Hf-Th, Nb-U, Ta-Zr, and Ta-V alloys were studied. The solubility of Nb in Zn vs. temperature, electrical measurements on Ca, temperature dependence of lattice parameters of U, and recalculation of Zr chips are reported. (For preceding period see ISC-607.) (J.E.D.)

3197 ISC-688

Ames Lab., Ames, Iowa.

PREPARATION OF ZIRCONIUM AND HAFNIUM METALS BY BOMB REDUCTION OF THEIR FLUORIDES. O. N. Carlson, F. A. Schmidt, and H. A. Wilhelm. Jan. 20, 1956. 28p. Contract W-7405-eng-82. \$4.80(ph OTS); \$2.70(mf OTS).

A bomb process for preparing Zr and Hf metals with Cu by the reduction of their tetrafluorides is described. A detailed method of preparing the high purity tetrafluorides is presented and the purity and physical properties of the metals obtained are discussed. (auth)

3198 KAPL-337

Knolls Atomic Power Lab., Schenectady, N. Y.

INVESTIGATION OF ALPLAUS ATMOSPHERIC PRESSURE SODIUM STILL. E. E. Baldwin. July 6, 1950. Decl. Nov. 22, 1955. 30p. Contract W-31-109-Eng-52.

As a result of two fires in the sodium still, an extensive investigation was made to determine the type and extent of damages and their cause. Results indicate that the external erosion and pitting was caused by action of the products of

combustion of the Na fires, the argon line plug was due to localized oxygen contamination of the Na, and the internal surface damages were negligible. (C.W.H.)

3199 NYO-7482

Franklin Inst. Labs. for Research and Development, Philadelphia.

TECHNICAL PROGRESS REPORT. SECTION I. [PROGRESS ON WORK]. SECTION II. DIFFUSION OF Au IN SINGLE CRYSTALS OF Ag. Mar. 1956. 16p. Contract AT(30-1)-1484. \$3.30(ph OTS); \$2.40(mf OTS).

Diffusion runs were made at eight temperatures in the range from 650 to 950°C, for times ranging from seven hours to fifteen days. A linear curve of the logarithm of the concentration versus the square of the penetration depth was obtained for all samples. Typical curves are shown. A "least-squares fit" of these data allow the diffusion coefficient to be calculated directly. The results for individual samples and a plot of the logarithm of the diffusion coefficients as a function of the reciprocal of the absolute temperature are given. (auth)

3200 Y-573

Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn.

SEPARATION OF ZIRCONIUM AND HAFNIUM. PROPOSAL FOR CONSTRUCTION AND OPERATION OF ZIRCONIUM PRODUCTION PLANT. J. M. Googin and G. A. Strasser. Mar. 14, 1950. Decl. Nov. 17, 1955. 12p. Contract W-7405-eng-26.

A re-evaluation of the cost of producing essentially hafnium-free Zr as zirconium oxide by solvent extraction of the metal thiocyanates in a permanent plant has been made. A by-product of the mixed oxides of Hf and Zr, high in Hf, can be made available with little additional cost. (auth)

PHYSICS

INSTRUMENTS

3201 AECU-3155

Los Alamos Scientific Lab., N. Mex.

A SIMPLE SWEEPING-IMAGE CAMERA (CHRONOGRAPH) WITH 10^{-8} SECOND RESOLUTION. Berlyn Brixner. [1955]. 17p. Contract [W-7405-eng-36]. \$3.30(ph OTS); \$2.40(mf OTS).

A sweeping-image camera design of flexible application and easy construction is described. It is equally useful for bread-board, optical bench, or completely engineered construction. The heart of this camera is the optical train which consists of a collimator lens that renders the light from the image points into parallel beams, a rotating mirror to sweep these beams in an arc, and a box camera set at infinity focus to receive the reflected beams. The sweeping light beams form images which move across the film plane while at the same time remaining in sharp focus. The collimator lens may have either the subject being studied as an object or its image whose extent can conveniently be limited by a slit. Cameras have been constructed with maximum writing speeds of 2 to 10 mm/ μ sec and apertures of f/2.5 to f/10.0. A resolving time of 10^{-8} sec is readily obtained in studies of explosive phenomena. (auth)

3202 AECU-3156

California. Univ., Los Angeles.

[A SIMPLE MECHANICAL CALCULATOR FOR SOLVING TRANSMISSION LINE EQUATIONS]. Technical Report No. 25. [1956]. 17p. Project No. NR022-053. Sponsored by ONR and AEC under contract N6onr-275-Task Order IV. \$3.30(ph OTS); \$2.40(mf OTS).

A simple mechanical calculator has been developed for solving the transmission line equations when the characteristic impedance is a variable. The speed of computation is some two orders of magnitude faster than analytical methods. The theoretical basis is described and also the way in which it can be used. Some representative problems, which have benefited by use of the calculator, are discussed. (auth)

3203 KY-166

Union Carbide Nuclear Co. Paducah Plant, Ky.

LOW FLOW VARIABLE LEAK. R. Millican. Feb. 14, 1956. 13p. Contract W-7405-eng-26. \$0.20(OTS).

A low-flow variable leak for mass spectrometer application was designed and constructed, which exhibits good control of flow rates from 20 Stc. cc/minute to less than 0.001 Std. cc/minute. (auth)

3204 UCRL-3173

California. Univ., Berkeley. Radiation Lab.

BUBBLE CHAMBER PRESSURE GAGE. William I. Linlor and Quentin A. Kerns. Oct. 20, 1955. 22p. Contract W-7405-eng-48. \$0.25(OTS).

A description is given of the mechanical gage and electrical circuit employed in measuring pressure pulses in a liquid H₂ bubble chamber. The pressure pulse produces a deflection of a diaphragm which acts as one electrode of a capacitor. The change in capacitance is measured in a circuit by measuring the difference in reflected pulses from two terminations at the ends of similar cables fed by a common source; one of the terminations is the pressure-measuring capacitor, the other is a comparison capacitor. (auth)

3205 UCRL-3195

California. Univ., Berkeley. Radiation Lab.

UTILIZING PLASTIC IMPREGNATION IN EQUIPMENT FOR NUCLEAR RESEARCH. William W. Salsig, Jr. Dec. 1955. 28p. Contract W-7405-eng-48. \$4.80(ph OTS); \$2.70(mf OTS).

The use of the polyester and epoxy resins in the construction of magnets, coils, and vacuum equipment is discussed. Examples of the use of these plastics are shown, including a vacuum pipe, an electromagnetic "motor" which drives the moving element of a large vibrating-blade capacitor, the coil treatment employed on a high-intensity auxiliary magnet used with the UCRL Bevatron, a small coil used to raise targets situated in the vacuum tank of the UCRL Bevatron, and a quadrupole or focusing lens magnet used with the UCRL Bevatron. Details of the fabrication of these components are included. (B.J.H.)

3206 UCRL-3237

California. Univ., Berkeley. Radiation Lab.

MAGNET POWER SUPPLY FOR ALPHA-PARTICLE SPECTROMETER II. George F. Schrader. Jan. 1956. 13p. Contract W-7405-eng-48. \$0.15(OTS).

A current-regulated power supply has been built to deliver current, continuously variable from 0 to 600 ma, into a load of 4000 ohms. The system is stable to approximately 1 part in 10,000 over long periods of time. Stability

has been achieved by using a series tube type of regulator with both a d-c amplifier and a chopper amplifier combined to give both long-time and short-time stability. (auth)

3207 UCRL-3288

California. Univ., Berkeley. Radiation Lab.

HOT WIRE LIQUID-LEVEL INDICATOR. Arturo Maimoni. Jan. 13, 1956. 14p. Contract W-7405-eng-48. \$3.30(ph OTS); \$2.40(mf OTS).

The theory of the method of measurement of liquid level by measurement of the resistance of a heated wire is developed, and it is applied to the design of a liquid-nitrogen-level indicator having a power dissipation of 3.4 milliwatts per inch of length and a deviation from linearity in the calibration of less than 0.1 inch over its working length of 2.0 inches. (auth)

3208 AEC-tr-2414

THE ELECTRON MICROSCOPE AND POLISHED METAL SURFACES. E. Bruche and H. Poppa. Translated by D. E. Cardamone from Metalloberfläche 9A, 129-35(1955). 5p.

The techniques used in the observation of metal surfaces with an electron microscope are briefly discussed, and some illustrations are given. (B.J.H.)

ISOTOPES**3209 HW-40459**

Hanford Atomic Products Operation, Richland, Wash.

A METHOD FOR THE DETERMINATION OF ISOTOPIC RATIO AND ACTIVITY IN Ru¹⁰³-Ru¹⁰⁶ MATERIALS. H. G. Rieck, Jr., and R. J. Walker. Dec. 15, 1955. 21p. Contract W-31-109-eng-52. \$4.80(ph OTS); \$2.70(mf OTS).

The isotopic ratio and activity in material containing Ru were determined by analysis of a gamma energy scan. Isotopic ratio was measured by comparing the two photo peaks resulting from the 0.50 and 0.61 Mev γ of Ru¹⁰³ and the 0.51 and 0.62 Mev γ of Ru¹⁰⁶. The activity was determined by application of a geometry factor to the 0.50-0.51 Mev γ photo peak height. (auth)

MASS SPECTROGRAPHY**3210 TID-5219**

Tennessee Eastman Corp., Oak Ridge, Tenn.

PROBLEMS OF PHYSICS IN THE ION SOURCE. Arthur H. Barnes, S. M. MacNeill, Chauncey Starr—H. Wesley Savage, ed. 1951. Decl. May 31, 1955. 202p. Contract W-7401-eng-23. (NNES-1-8). \$1.50(OTS).

A complete treatment is presented of the fundamental processes involved during the operation of the calutron source units. A section on the production of ions in the calutron includes discussions on cathodes and defining slots, production-improvement studies, and the accelerating system and ion beams. Vapor production and control in the calutron is also thoroughly discussed, including topics such as the problems associated with vapor production, charge studies, and external feed systems. The nature of electron drain, drain-control systems, and ceramic drain control are also considered. (B.J.H.)

MATHEMATICS**3211 ORNL-2037**

Oak Ridge National Lab., Tenn.

MATHEMATICS PANEL SEMIANNUAL PROGRESS RE-

POR T FOR PERIOD ENDING DECEMBER 31, 1955. A. S. Householder, ed. Mar. 13, 1956. 33p. Contract W-7405-eng-26. \$4.80(ph OTS); \$2.70(mf OTS).

Changes made in the subroutine library are discussed. A complex of codes to perform the basic operations of matrix algebra is being developed to yield uniform data treatment, method accuracy, and speed. A routine has been programmed for solving systems of equations and inverting small-order matrices. Several programs leading to the calculation of absorption cross sections for various materials were run. NaI detector activation is considered. Codings for reducing Echellogram data to least-square values and their probable errors are near completion. A polynomial least-squares fit of 10 emf-temperature values for $\text{In}_2(\text{SO}_4)_3$ was made and the function E'' , defined. A routine was prepared which constructs from any 6 measurements of thermodynamic properties the corresponding system of observational equations whose coefficients satisfy the equations for specific heat, entropy, enthalpy, and free energy in chemical reactions. Progress is reported in reactor calculations, mutation rates, isotope exchange, and radiation-induced chromosomal aberrations models. (For preceding period see ORNL-1928.) (D.E.B.)

Refer also to abstract 3237.

MEASURING INSTRUMENTS AND TECHNIQUES

3212 ORNL-2050

Oak Ridge National Lab., Tenn.

GEOMETRICAL CORRECTIONS FOR ANISOTROPICALLY EMITTING SOURCES. M. E. Rose. Mar. 19, 1956. 12p. Contract W-7405-eng-26.

Alpha particle angular distribution studies led to an investigation of necessary geometrical considerations. Assuming coaxial circular source and detector, uniform emission, detector efficiency, and good geometry, a method of determining geometrical corrections is developed. (D.E.B.)

3213 TID-5055

Brookhaven National Lab., Upton, N. Y.

SERIAL REPORTS ON START-UP EXPERIMENTS. NO. 5. COUNTING LOSSES IN BF₃ PROPORTIONAL COUNTER SYSTEM. V. L. Sailor. Mar. 22, 1951. Decl. Nov. 21, 1955. 11p. Contract [AT-30-2-Gen-16].

The counting losses resulting from the time characteristics of various circuit components constitute an important correction to the data obtained with BF₃ proportional counter during the startup of the BNL reactor, especially in the cases where counting rates were 10^4 counts/sec or higher. Correction factors were calculated for two counting systems made at BNL. A third counting system made by Nuclear Instruments Company required no correction below 18,000 counts/sec but was found unreliable above so that a correction factor was not calculated. The length and type of video cable between the amplifier and the scaler was found to seriously alter the resolving time so that this must be considered in choosing the correction factor. (B.J.H.)

3214 AEC-tr-2399

RADIATION CONTROL BY PHOTOGRAPHIC RECORDING OF FLUORESCENCE. K. Sommermeyer and G. Heiner. Translated by D. E. Cardamone from Naturwissenschaften 42, 508(1955). 2p.

Radiation dosages and exposure times were estimated from the blackening of photographic plates due to fluorescence from exposed organic phosphors. In the range, 0.1 to 0.8r, doses were estimated with a $\pm 20\%$ error. (C.W.H.)

Refer also to abstract 3209.

MESONS

3215 UCRL-3271

California. Univ., Berkeley. Radiation Lab.

INTERPRETATION OF K-MESON DECAYS. S. Bludman. Jan. 27, 1956. 5p. Contract W-7405-eng-48. \$0.15(OTS).

Suggestions are given for a possible examination of the K-meson lifetimes which may be subject to experimental verification. The explanation of the nearly equal τ and θ lifetimes is based on the fact that if τ and θ decay into μ and ν at the same rate $R_{\tau\mu} = R_{\theta\nu}$ then the τ and θ lifetimes are bound to be approximately equal. (B.J.H.)

3216 UCRL-3314

California. Univ., Berkeley. Radiation Lab.

SIMPLE CONSIDERATIONS RELATING STRANGE-PARTICLE LIFETIMES. Arthur H. Rosenfeld and M. Lynn Stevenson. Feb. 20, 1956. 4p. Contract W-7405-eng-48. \$1.80(ph OTS); \$1.80(mf OTS).

Refer also to abstract 3223.

MICROWAVES

3217 NBS-4514

National Bureau of Standards, Washington, D. C.

CORRECTIONS IN HIGH ACCURACY FRESNEL REGION MICROWAVE INTERFEROMETRY. E. S. Dayhoff. Feb. 1956. 104p. NBS Project 8402-10-8921. Sponsored by OSR; and AEC under Contracts NAord-21-48 and CS-640-55-9. \$16.80(ph OTS); \$5.70(mf OTS).

The attainment of high absolute accuracy in phase velocity measurements by microwave interferometry requires a knowledge of the low-order corrections to measured phase velocity. These low-order corrections in the case where the wavelength is small but not negligible compared with the dimensions of the apparatus and the radiating aperture subtends at least one Fresnel zone from the mid point of the travelling mirror were studied. An expression is obtained giving the correction to be applied to the observed wavelength in terms of the antenna pattern of the radiator. A discussion is also given of the sources and effects of multiple paths of propagation as they would influence phase velocity measurements. Methods for their reduction and correction are suggested. (auth)

NEUTRONS

3218 AECD-3718

Oak Ridge National Lab., Tenn.

AN ESTIMATE OF THE NEUTRON REFLECTION COEFFICIENT USING THE CONCEPT OF REMOVAL CROSS SECTION. H. E. Stern. Sept. 29, 1953. Decl. Nov. 18, 1955. 5p. Contract W-7405-eng-26. (CF-53-9-161).

3219 CF-56-2-78

Oak Ridge National Lab., Tenn.

EFFECT OF GEOMETRY ON RESONANCE NEUTRON AB-

SORPTION. Lawrence Dresner. Feb. 20, 1956. 17p.

\$3.30(ph OTS); \$2.40(mf OTS).

A simple theoretical expression has been derived for the geometric dependence of effective resonance integrals which is independent of the details of resonance structure. Comparison with experiment yields good agreement. (auth)

3220 KAPL-1469

Knolls Atomic Power Lab., Schenectady, N. Y.

AVERAGES OF THERMAL CROSS SECTIONS FOR HYDROGEN-MODERATED ASSEMBLIES. P. F. Zweifel and C. D. Petrie. Jan. 1, 1956. 36p. Contract W-31-109-Eng-52. \$0.30(OTS).

Average thermal cross sections are found using the Wigner-Wilkins thermal neutron spectrum assuming moderation by a perfect gas of hydrogen molecules in the presence of a $1/v$ absorber. Results are given for $\sigma_a^{U^{235}}$, $\sigma_a^{Xe^{136}}$, a $1/v$ cross section, $\sigma_{H^2}^H$ and $\lambda_{H^2}^H$. The diffusion length is calculated for pure water, and methods of calculating diffusion lengths for combinations of other materials with water are indicated. The results of the diffusion length calculations appear to be in reasonable agreement with experiment. (auth)

3221 UCRL-4641

California. Univ., Livermore. Radiation Lab.

PRODUCTION OF SHORT BURSTS OF NEUTRONS. M. Paul Nakada. Sept. 20, 1955. 11p. Contract W-7405-eng-48. \$3.30(ph OTS); \$2.40(mf OTS).

Four-millimicrosecond bursts of neutrons have been produced with good intensity by sweeping the d-c beam of a Cockcroft-Walton past a slit and by further bunching those ions which pass through the slits. (auth)

NUCLEAR PHYSICS

3222 UCRL-3223

California. Univ., Berkeley. Radiation Lab.

PHYSICS DIVISION QUARTERLY REPORT [FOR] AUGUST, SEPTEMBER, OCTOBER 1955. Dec. 1, 1955. 47p. Contract W-7405-eng-48. \$7.80(ph OTS); \$3.30(mf OTS).

Developmental and experimental work on the 4-, 10-, and 72-in. liquid H₂ bubble chambers was continued. Meson (K) lifetime studies indicate a mean value of $1.3 \pm 0.1 \times 10^{-8}$ sec. Alpha particle range spectra have been taken at the angles 15, 30, and 90° for the reaction C¹²(p,α)B⁹. The 2.4-Mev level appears roughly constant while the ground state shows a strong angular dependence. K particle mass and energy studies are reported. Consideration is given to the use of nuclear emulsions in this work. Comments on theoretical approaches to particle lifetime, decay, spin, scattering, annihilation, and energy are included. Research on elastic proton-proton scattering, antiproton observation, K⁻ interactions, and K⁻ mass determinations was continued. Recent developments in these studies are reported. Measurements of the cross section for proton gamma ray scattering in the 100 to 145 Mev range are being made at the synchrotron. Preliminary results indicate a cross section approximately equal to the Thompson cross section. Status reports are given on studies of neutron yields at 32-Mev, π⁰ mesons from proton-proton collisions, π⁺ cross sections, proton-proton interactions at 5.3 Bev, π⁻-p interactions at 4.5 Bev, and meson mass and decay. The generation energy and methods for making charge and

mass determinations for antiprotons are discussed. The antiproton research program is outlined. A 3-day Bevatron run gave 500 n-p events showing pion production. Methods of meson production in these events are suggested. (For the preceding period see UCRL-3115.) (D.E.B.)

3223 AEC-tr-2382

EXCITED STATES OF NUCLEONS. I. I. Gurevich. Translated by Rose V. Jermain from Doklady Akad. Nauk S.S.R. 105, 69-72(1955). 5p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 10-2143.

3224 AEC-tr-2395

CAPTURE GAMMA-RAYS OF THERMAL NEUTRONS AND THE STRUCTURE OF ATOMIC NUCLEI. L. V. Groshev. Translated from Doklady Akad. Nauk S.S.R. 100, 651-4(1955). 4p. Available from Associated Technical Services (Trans. 93H8R), East Orange, N. J.

For light elements, the capture gamma spectra consist of sufficiently well resolved monochromatic lines. Among the intermediate and heavy elements these monochromatic lines are located in a continuous spectrum. The fraction of the excitation energy emitted as gamma rays is measured for 45 elements and the results plotted. Maxima appear at the "magic" numbers. (D.E.B.)

NUCLEAR PROPERTIES

3225 UCRL-4588

California. Univ., Livermore. Radiation Lab.

A NEW EMPIRICAL MASS EQUATION. I. ATOMIC MASSES IN FISSION-PRODUCT REGION. Harris B. Levy. Nov. 30, 1955. 28p. Contract W-7405-eng-48. \$0.25(OTS).

A new empirical equation has been developed for atomic masses. This equation has been applied to atomic masses in the fission-product region. In order to keep the working numbers small, the form used is that of an expression for the mass defect, $\Delta M = M - A$, as a function of Z and A. The equation has the form: $\Delta M(A, Z) = \alpha_0 + \alpha_1 A + \alpha_2 Z + \alpha_3 AZ + \alpha_4 Z^2 + \alpha_5 A^2 + \delta$. Atomic masses calculated from this equation agree with experimental values to within ± 0.5 millimass unit in 71% of the 217 nuclides studied and agree to within ± 1.5 millimass units in over 95% of the nuclides. Beta-decay energies were calculated with the new equation and checked against 85 experimental values. Agreement of the calculated values with experiment was better than ± 0.5 Mev in 93% of the cases and within ± 0.2 Mev in 80%. (auth)

NUCLEAR REACTORS

3226 ANL-5513

Argonne National Lab., Lemont, Ill.

THE FAST CRITICAL ASSEMBLY. B. C. Cerutti, David Okrent, R. E. Rice, F. W. Thalgott, and H. V. Lichtenberger. Jan. 1956. 29p. Contract W-31-109-eng-38. \$0.25(OTS).

The fast zero power reactor experiment (ZPR-III) is planned to obtain neutron physics information necessary for the design of fast power breeder reactors. The systems to be studied are blanketed cores having a range of compositions in which the volume fractions of U²³⁵, U²³⁸, Fe, and Na

(simulated by reduced density Al) are varied. This is accomplished by assembly of small pieces in drawers which are placed in an array of square tubes mounted on two carriages so that two half-critical sections initially separated may be brought together in a carefully controlled manner. The reaction is controlled by inserting or removing drawers from the back of each half of the reactor with drives which are continually activated for scram under air pressure. Five of these safety-control drawers are provided in each half and may operate either in the core or blanket. The build up of the first critical assembly was begun October 18, 1955, and the assembly went critical two days later, October 20. (auth)

3227 BNL-1783

Brookhaven National Lab., Upton, N. Y.

INTRACELL FLUX TRAVERSES. Herbert Kouts. Oct. 28, 1953. Decl. Oct. 17, 1955. 35p. Contract AT-30-2-Gen-16.

In order to find the thermal utilization in slightly enriched U light water-moderated lattices, the flux variation over individual lattice cells was measured. Measurements were made with 0.600-in.-diam. rods of 1.3% enrichment and with 0.750-in.-diam. rods of 1.027% enrichment. Flux plots were made at water-to-fuel volume ratios of 4:1, 3:1, 2:1, 1.5:1, and 1:1. A set of measurements was made with various concentrations of B_2O_3 dissolved in the moderator. (B.J.H.)

3228 BNL-1796

Brookhaven National Lab., Upton, N. Y.

INTRACELL FLUX TRAVERSES AND THERMAL UTILIZATIONS, 1.027% ENRICHMENT URANIUM RODS IN LIGHT WATER. Herbert J. Kouts, Kenneth W. Downes, Glen A. Price, Rudolph Sher, and Valentine J. Walsh. Mar. 24, 1954. Decl. Oct. 27, 1955. 24p. Contract AT-30-2-Gen-16.

The distribution of thermal neutrons has been measured in typical lattice cells in multiplying assemblies of 1.027% enriched U rods in ordinary water. Relative fluxes were found with small foils of dysprosium oxide dispersed in lucite and polyethelene. The measured flux distributions are given, and the implied thermal utilizations are calculated. (auth)

3229 BNL-1812

Brookhaven National Lab., Upton, N. Y.

LIGHT WATER LATTICE STUDIES—PAPER PRESENTED AT THE REACTOR INFORMATION MEETING AT ANL, OCTOBER 7-9, 1953. H. Kouts. Nov. 5, 1953. Decl. Oct. 27, 1955. 8p. Contract AT-30-2-Gen-16.

A study was made of pile core parameters for light water moderated, slightly enriched uranium rod assemblies. This information is provided by measurements in a series of exponential assemblies which differ in uranium enrichment, moderator-to-fuel volume ratio, and rod diameter. The enrichment range explored varies from 1.3% to 1%, the rod diameters vary from 0.600 to 0.250 in., and the volume ratios lie in the range from 4:1 to 1:1 (and in some cases are even smaller). The quantities measured were f , ϵ , p , B^2 , M^2 , and reflector savings (since the assemblies are reflected). Similar measurements reported at the last Reactor Information Meeting were done with 0.750" diameter rods with 1% nominal enrichment. (auth)

3230 MonP-357

Citizen Labs., Oak Ridge, Tenn.

CRITICAL EXPERIMENTS ON A SMALL REACTOR OF ENRICHED U^{235} WITH $Al-H_2O$ MODERATOR, AND D_2O , BE AND H_2O REFLECTORS. M. M. Mann and A. B. Martin. Aug. 18, 1947. Decl. Sept. 20, 1955. 21p. Contract W-35-058-eng-71.

Complete descriptions and diagrams are given of the experimental arrangements. Resultant critical masses of U^{235} are tabulated, and neutron flux distributions in the critical assembly are shown. (B.J.H.)

3231 TID-5047

Brookhaven National Lab., Upton, N. Y.

SEQUENCE OF STARTUP OPERATIONS. L. B. Borst. Aug. 4, 1950. Decl. Nov. 16, 1955. 7p. Contract AT-30-2-Gen-16.

The startup sequence for the Brookhaven Reactor is given. (D.E.B.)

3232 TID-5050

Brookhaven National Lab., Upton, N. Y.

INITIAL EXPERIMENTS ON THE BROOKHAVEN REACTOR. III. ANALYSIS OF THE CLINTON CRITICAL EXPERIMENT. J. Chernick. Mar. 28, 1949. Decl. Dec. 2, 1955. 11p. Contract [AT-30-2-Gen-16].

Fundamental pile constants for the ORNL Graphite Reactor are computed and compared with previously published values. (D.E.B.)

3233 TID-5051

Brookhaven National Lab., Upton, N. Y.

INITIAL EXPERIMENTS ON THE BROOKHAVEN REACTOR. IV. BASIC DATA FOR THE BNL REACTOR. J. Chernick. Apr. 21, 1949. Decl. Dec. 2, 1955. 21p. Contract [AT-30-2-GEN-16].

The fundamental parameters of the BNL Reactor are evaluated. Among these are the effective multiplication factor of the reactor at various loadings, cartridge requirements, central flux in subcritical loadings, and expected pile periods in loadings over critical. (B.J.H.)

3234 TID-5057

Brookhaven National Lab., Upton, N. Y.

DETERMINATION OF CENTRAL FLUX WITH INDIUM FOILS. V. L. Sailor. Feb. 6, 1951. Decl. Nov. 9, 1955. 2p. Contract [AT-30-2-Gen-16].

A method of neutron flux determination involving In foil irradiation, HNO_3 dissolution, dilution, and aliquot counting is reported. (D.E.B.)

3235 TID-8009

Technical Information Service, AEC.

AEC'S EXPERIMENTAL PROGRAM ON REACTOR SAFETY. Richard H. Graham and D. Glenn Boyer, Div. of Reactor Development, AEC. 7p. \$0.15(OTS).

One of its monograph series "The Industrial Atom."

Heterogeneous and homogeneous reactor experiments designed to establish maximum safety factors for reactor operation are reviewed. Large reactor excursions, safety fuses, molten metal- H_2O reactions, container tests, and fuel ignition are discussed. (D.E.B.)

3236 UCRL-4622

California Univ., Livermore. Radiation Lab.

SOLUTIONS OF THE REACTOR KINETICS EQUATIONS FOR TIME-DEPENDENT REACTIVITIES. Milton Ash.

Dec. 14, 1955. Decl. Feb. 17, 1956. 16p. Contract W-7405-eng-48. \$3.30(ph OTS); \$2.40(mf OTS).

The reactor kinetics equations are combined into a single integral equation whose kernel describes the time-dependent characteristics of the reactor including six delayed groups of neutrons. Numerical solutions of the integral equation are given for constant, linear and $\int_0^t \sin^2 kx dx$ reactivities. An approximate solution of the integral equation is obtained which provides a basis for the formulation and solution of the reactor system control problem using the methods of servomechanisms theory. The reactor frequency response function, a product of the approximate solution, is calculated and plot given. (auth)

3237 WAPD-TN-520

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

THE PROBLEM OF MOMENTS WITH APPLICATION TO NEUTRON FLUX DISTRIBUTION. J. S. Langer and R. S. Varga. Nov. 1955. 32p. Contract AT-11-1-gen-14. \$4.80(ph OTS); \$2.70(mf OTS).

The transport equation for the slowing down of neutrons is commonly solved for one or both of two things: the Fourier transform or a finite number of the so-called "moments" of the distribution. Both of these arise naturally from the particular mathematics involved in the solution of the problem, and both are of direct interest in reactor calculations. There is considerable interest in the actual flux shape; thus there arises the problem of inversion. A critical survey of the numerical moment inversion techniques which have been found useful is reported. At the present time investigations of the Fourier inversion problem are being carried out. (auth)

Refer also to abstract 3220.

NUCLEAR TRANSFORMATION

3238 AEC-tr-2386

ANGULAR DISTRIBUTION OF FRAGMENTS IN URANIUM²³⁸ FISSION INDUCED BY NEUTRONS OF VARIOUS ENERGIES. A. A. Varfolomeev, A. S. Romantseva, and V. M. Kutukova. Translated by Rose V. Jermain from Doklady Akad. Nauk S.S.R. 105, 693-5(1955). 3p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 10-3289. (D.E.B.)

Refer also to abstracts 3246 and 3247.

PARTICLE ACCELERATORS

3239 UCRL-3236

California. Univ., Berkeley. Radiation Lab.

BEVATRON OPERATION AND DEVELOPMENT. VII.

[Period covered] August, September, October 1955. Walter Hartsough. Dec. 16, 1955. 26p. Contract W-7405-eng-48. \$4.80(ph OTS); \$2.70(mf OTS).

The major physics research effort was directed toward the detection of the antiproton. Negative particles of proton mass were first counted on September 22, 1955. On October 19, 1955 the discovery and identification of the antiproton was announced. Total cross-section measurements for π^+ and π^- mesons continued. A study was made of neutron in-

teractions and of the γ -ray decay products of mesons. Proton-proton scattering was done at 2 and 4 Bev using counters, and at 5.5 Bev using a 35-atmos. diffusion cloud chamber. Emulsion exposures to protons were made for three groups outside the laboratory. The bevatron-facilities were improved by the addition of a heavy-duty inner-radius platform at the experimental area. New thin windows, an improved plunging beam clipper, a new 4-in. quadrupole-magnet set, and a new 12-by-60-in. analyzing magnet were added to the experimental facilities. Improvements were made in magnet-current stabilization and in reliability of the r-f accelerating systems. The beam was successfully tracked during a step in peak magnet current, and for a short time into inversion. (auth)

3240 UCRL-3250

California. Univ., Berkeley. Radiation Lab.

TWO ELECTRON MODELS OF A CONSTANT-FREQUENCY RELATIVISTIC CYCLOTRON. Elmer L. Kelly, Robert V. Pyle, R. L. Thornton, J. Reginald Richardson, and Byron T. Wright. Dec. 23, 1955. 40p. Contract W-7405-eng-48. \$0.30(OTS).

Two model constant-frequency cyclotrons based on the principle of L. H. Thomas, as extended by David L. Judd, are described. Both accelerated electrons to speeds of half that of light in magnetic fields of threefold azimuthal periodicity. Three 60°-wide wedge-shaped electrodes, driven 120° out of phase, provided an energy gain per revolution of 3 ev, where v is the peak electrode-to-ground voltage. Electrons were accelerated to 75 kv with v = 23 volts, implying a minimum of one thousand revolutions in the cyclotron. The beam reached full energy without axial loss and it was demonstrated that essentially all of the circulating current will emerge from this type of accelerator without the use of additional deflecting systems. The success of this development program has shown the feasibility of a high-current, high-energy cyclotron based on the Thomas principle. (auth)

RADIATION ABSORPTION AND SCATTERING

3241 UCRL-3273

California. Univ., Berkeley. Radiation Lab.

ELASTIC SCATTERING OF 30-MEV PROTONS (thesis). John Leahy. Feb. 1956. 38p. Contract W-7405-eng-48. \$6.30(ph OTS); \$3.00(mf OTS).

The differential elastic cross section for 31.5-Mev protons on Al, Cu, Ag, Ta, Au, and Pb has been measured from 10° to between 140 and 170° in the laboratory system at intervals of 5° or less. All elements exhibit the typical diffraction-type maxima and minima in the cross section. Theoretical calculations have been obtained for these data, based on an optical model with a complex, rounded, nuclear potential. At this energy, fits to the data are obtained for values of the real and imaginary parts of the potential well of about 35 Mev and 15 Mev respectively. The radius parameter, r_0 ($R_0 = r_0 A^{1/3}$), and the rounding parameter, a, are 1.33×10^{-13} cm and about 0.50×10^{-13} cm respectively. (auth)

3242 AEC-tr-2383

PHASE ANALYSIS OF PROTON-PROTON SCATTERING.

A. Zimin. Translated by Rose V. Jermain from Doklady Akad. Nauk S.S.R. 105, 73-6(1955). 4p.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 10-2188.

RADIOACTIVITY

3243 CF-56-3-65

Oak Ridge National Lab., Tenn.

INVESTIGATION OF CHROMIUM-55. T. H. Handley and S. A. Reynolds. Mar. 14, 1956. 3p. Contract [W-7405-eng-26].

Investigations which were carried out on the γ activity resulting from neutron bombardment of Cr⁵⁴ indicated that this γ activity is probably due to a vanadium impurity (≈ 0.6 ppm). An upper limit of $<0.01\%$ was placed on gamma associated with Cr⁵⁵. (C.W.H.)

3244 KAPL-1443

Knolls Atomic Power Lab., Schenectady, N. Y.

PROBLEMS AND COSTS ENCOUNTERED IN THE HANDLING OF IRRADIATED FUELS. L. O. Sullivan. Sept. 1, 1955. 35p. Contract W-31-109-Eng-52. \$0.25(OTS).

Operating experience in the Radioactive Materials Laboratory is described, with emphasis on problems and costs encountered in the handling of irradiated fuels. (auth)

SPECTROSCOPY

3245 AEC-tr-2398PURIFICATION OF HYDROCARBONS AS SOLVENTS FOR ULTRAVIOLET SPECTROSCOPY. Gerhard Hesse and Hermann Schildknecht. Translated by K. S. Bevis from *Angew. Chem.* 67, 737-9(Dec. 1955). 6p.

Adequate purification of hexane and cyclohexane for use as solvents for ultraviolet spectroscopy was obtained by treatment with H₂SO₄ and concurrent filtration through an Al₂O₃ column. (auth)

Refer also to abstract 3178.

URANIUM AND URANIUM COMPOUNDS

3246 UCRL-3266

California. Univ., Berkeley. Radiation Lab.

FISSION AND SPALLATION EXCITATION FUNCTIONS OF U²³⁸ (thesis). Susanne Elaine Ritsema. Jan. 20, 1956. 46p. Contract W-7405-eng-48. \$0.35(OTS).

Fission and spallation products produced in 22 to 46-Mev helium-ion bombardments of U²³⁸ were isolated by chemical methods. Various isotopes were identified by their radioactive properties. Absolute fission and spallation cross sections were determined at various energies and plotted as a function of energy. The (α , p2n) reaction was observed below the threshold for evaporation of a proton and two neutrons and, therefore, it was concluded that tritium emission is occurring. The (α , an) product was the most prominent spallation product observed. Fission yield curves show an increase of symmetry with energy, and the minimum in the fission yield curve vanishes at 40 Mev. (auth)

3247 AEC-tr-2409

FISSION AND CHAIN DISINTEGRATION OF URANIUM.

Ya. B. Zel'dovich and Yu. B. Khariton. Translated from *Uspekhi Fiz. Nauk.* 23, 329-57(1940). 25p. Available from Associated Technical Services (Trans. 21H9R), East Orange, N. J.

An outline is given of various investigations of uranium fission and chain disintegration. The basic phenomena, the fission mechanism, uranium and thorium fission products, and the emission of neutrons and γ rays during fission are discussed. Analysis is given of the yield and energy distribution of neutrons from uranium interacting with slow neutrons, and chain disintegration of uranium with fast and slow neutrons. The material outlined shows that it is impossible, at the date of this article, to reach any final conclusions about the possibility of producing a nuclear chain reaction in uranium. (R.V.J.)

NOTICE

It has been necessary to omit the Author Index and Numerical Index of Reports usually included in this issue. Cumulated indexes for Vol. 10, Nos. 1-12A, will appear in No. 12B, dated June 30, 1956.

